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Director’s Message

Acting Director Mike Cassidy announces new developments at California Center for Innovative Transportation, California Partners for Advanced Transit and Highways, the UC Berkeley Volvo Center for Future Urban Transport, and the Transportation Sustainability Research Center, as well as a tragic passing and a new addition.

Sitting on the Tarmac: Reducing Delays at Kennedy, LaGuardia, and Newark Airports

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Jasenka Rakas’ airport design students grapple with real-world, real-time aviation issues in her popular CE 153 class.

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UC Berkeley dual-degree master's student Laura Stonehill wins the top paper prize from the American Planning Association's Transportation Planning Division.

Transportation Ph.D. student Kitae Jang wins ITE "Sustainable Living in the Suburbs" student paper grand prize.

UC Berkeley Transportation Ph.D. Nikolaos Geroliminis named UCTC Student of the Year.

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Message from Acting Director Mike Cassidy

The academic year has drawn to a close, and I’m happy to announce that it has been marked by a good many favorable developments for the Institute. Last month, for example, the U.S. DOT awarded its inaugural Safe Trip 21 grant, a competition that encourages partnerships for innovative technology, to a public-private consortium that includes two ITS centers: the California Center for Innovative Transportation (CCIT) and California Partners for Advanced Transit and Highways (PATH).

The grant funds the next phase of CCIT’s ground-breaking research that taps the potential of cell phone networks to both collect and share real-time information on traffic conditions and transit operations. CCIT, in partnership with Nokia, Navteq, Nissan, Caltrans, the Metropolitan Transportation Commission, and others, will demonstrate work at this November’s World Congress on Intelligent Transport Systems.

The Safe Trip-21 award also provides key support for PATH researchers to build upon their ongoing work to enable communication between vehicles and roadway infrastructure (e.g., to alert drivers to road hazards). PATH is also gearing up to move its bus rapid transit guidance system off of the Richmond Field Station and onto city streets and highways. A summer demonstration along an AC Transit route in San Leandro, Calif., will launch the deployment phase of the technology’s development, which gets underway in July with sponsorship from the Federal Transit Administration, the Research and Innovative Technology Administration (RITA), and the California Department of Transportation (Caltrans).

Our UC Berkeley Volvo Center for Future Urban Transport has also seen its share of success. In May, for example, it hosted the Volvo Foundation’s annual conference and workshop on urban transport. It was an outstanding event by all accounts. On a similar note, earlier this year UC Berkeley was named to host the 19th International Symposium of Traffic and Transportation Theory, to be held in July 2011. The symposium is a premier event among transport theorists (so mark your calendars!).

I’m also pleased to report that the Institute has added a key member to its staff. Ann Brody Guy joined us in November as the new Communications Director and has since been doing a terrific job in strengthening and developing communication links, both within the Institute and with the outside world.

Not all the news has been happy. This year we have also been touched by profound sorrow. I’m speaking here of the unexpected death of Professor Alex Farrell, who directed the Transportation Sustainability Research Center. Alex was an exceptionally fine young scholar—a real rising star—and was the best kind of colleague. His passing leaves a hole that will never really be filled. And yet, the Sustainability Center will continue its important work, as it must. In this regard, we are indebted to doctors Susan Shaheen and Timothy Lipman, who have stepped in to jointly serve as the Center's acting directors.

Speaking of acting directors, the close of the academic year means that my tenure as Acting ITS Director is nearing its end. Samer Madanat returns this summer and will resume his leadership of the Institute.

I'm grateful for having had the chance to fill in during Samer's absence, and I have greatly enjoyed the added opportunities this has given me to work with the people who make up ITS.

Have a good and productive summer,

Mike Cassidy, Acting Director (but only for another month or so!)

PDF of article
Sitting on the Tarmac: Reducing Delays at Kennedy, LaGuardia, and Newark Airports

A NEXTOR-Led Discussion Among Key Aviation Players at the 2008 Meeting of the Transportation Research Board (TRB)

NEXTOR graduate student Megan Smirti introducing the panel on New York aviation issues at TRB.

While introducing the “Pangs of New York” TRB session she helped to organize, Megan Smirti joked that one of her motivations was “to save the air traveling children of New York from becoming jaded air traveling adults.” Raised on Long Island in a neighborhood between LaGuardia and Kennedy airports where delays and cancellations were the rule, Smirti learned that air travel was “inconvenient and unreliable. To this day,” she says, “I am surprised when a flight is not delayed.”

The more serious reason for the gathering, noted Smirti, is the sharp increase in delays and unreliability in the National Aviation System, particularly at the New York airports. For Smirti, who is a Ph.D. student at the ITS aviation research arm, the National Center of Excellence in Aviation Operations Research (NEXTOR), the rise in delays has a strong bearing on her research. She is focusing on solutions to reduce aircraft-generated greenhouse gas emissions. “Reducing airborne holding and idling is a way to achieve that,” she said.

Setting the scene for the discussion to follow, Smirti described the geographical and geopolitical implications of the New York metropolitan area’s airspace. John F. Kennedy International Airport (JFK) and LaGuardia International Airport (LGA) are located on either end of the borough of Queens, with JFK serving as a gateway for both domestic and international travel, while LaGuardia is a major domestic airport. Newark is a hub for air and freight carriers, including Continental, and has extensive domestic and international traffic.

The Northeast corridor’s effect on the national airspace

Because they are hubs and also located in the heavily traveled Northeast corridor, the New York airports have a high number of operations (take-offs and landings). And, she noted, there are two seasons with extreme weather: summer with its thunderstorms, and winter with snow and ice.

“While these have been features for years, the summer of 2007 saw the worst congestion ever,” Smirti noted, with a 29 percent increase in delays, despite a three percent reduction in operations.

And because of their strategic role in the overall national airspace, delays last summer at New York airports rippled across the country. The situation drew national attention with comments by President George Bush and the appointment of a special aviation rulemaking committee (the New York Aviation Rulemaking Committee, ARC) by Transportation Secretary Mary Peters. ARC was charged...
with focusing on items that could be implemented in time to reduce delays for the summer of 2008, while also developing longer-term solutions that could be agreed upon by the entire aviation industry.

"Reducing delays at these airports has become a high priority issue," Smirti noted.

### Aviation leaders outline their positions

To better understand what is involved, TRB's Airfield and Airspace Capacity and Delay Committee, which is chaired by Mark Hansen, professor of civil engineering at UC Berkeley, and director of the Berkeley arm of NEXTOR sponsored this gathering. It drew the major players in this arena. Panelists included senior staff from the Port Authority of New York and New Jersey, which operates the three airports; the Federal Aviation Administration (FAA), the federal agency that regulates the aviation industry; the Air Transport Association of North America, the airlines’ leading trade group; NEXTOR; aviation consultants from the MITRE Corporation and GRA, Inc.; and the federal government’s Volpe National Transportation Systems Center.

Below are some excerpts and summaries of each speaker's comments, which they were invited to make, on the subject of air travel delays. To encourage a panel-like meeting, speakers were asked to prepare a short comment on the delay situation, and then prepare to respond to a series of questions. Listen to the entire session on the TRB e-session site here.

**"No question" that 2007 was a bad year**

Ken Wright, of the MITRE corporation, opened the discussion by confirming that there was “no question” that 2007 had been a bad year nationwide. “Nearly seven percent of commercial flights were more than one hour late,” he said, citing data collected from 45 airports, higher than any year dating back to 2000. In New York, delays tripled from 2004 to 2007 at the three airports, with LaGuardia and Kennedy having the largest share. Part of the problem is due to reduced “throughput” at Newark and LaGuardia due to stricter separation standards for take-offs and landings. At Kennedy, some of the blame lies in the fact that the number of scheduled operations has risen 44 percent since 2005, he noted.

“Another noteworthy trend is a four- to five-fold increase in airborne holding, which is aircraft circling while they wait for a turn to land,” he added. In October, for example, airplanes circled for nearly 80,000 minutes above the three airports, the equivalent of 55 days. At $60 per minute in operating costs, that comes to nearly $5 million for that month alone.

### Small reductions could mean big gains

Michael Ball, professor of civil engineering at the University of Maryland arm of NEXTOR and NEXTOR’s co-director, declared that the solution to delays lay in improving access to airports and enacting broader, longer-term solutions across the system, versus “crisis mode.” He pointed out numerous redundancies that lead to inefficiencies: one example, three airlines provide hourly service between LaGuardia and Washington National airport, and there are 18 flights per day from Raleigh-Durham to LaGuardia on planes that have 70 or fewer seats.

If you reduced those flights just 10 percent, would passenger service really be diminished? he asked. Instead of three flights per hour, there would be three flights for some hours and two for others, between Washington and LaGuardia. Service to Raleigh-Durham would go from 18 flights to 15 flights. While service wouldn’t be diminished much, “the impact on delay is very substantial,” he said. To accomplish this, he suggested airlines use slightly larger aircraft and cut down the number of flights slightly.

As for moderating demand, Ball pointed to European rules that impose slot controls on airports through administrative rules. Ball proposed a market-based alternative, either congestion pricing or auctioning slots. Those approaches widen access to slots and provide an incentive to build more capacity if it is needed.

### More room to grow, not limits on flights

Patty Clark, a senior official with the Port Authority of New York and New Jersey which runs the three New York airports, issued a “strong” endorsement of airport operators’ right to decide how their airports will operate and an equally strong condemnation of any efforts to put a limit on the number of flights airports are allowed to handle.

The delays of 2007 did not come as a surprise to the New York carriers and airport operators, she said. As early as the fall of 2006, the airlines at the three airports were aware that trouble was on the horizon. Her agency led a team of 14 carriers to the FAA to say that “we have a problem.” In March of 2007, the
group identified 17 incremental steps that they could put in place by summer 2007: technology upgrades and other enhancements that improve capacity. But the core commitment was that no one who wanted to fly out of a New York area airport would be turned away. "We always want to accommodate the demand of folks who want to come to and leave our region. That is where we fundamentally, and respectfully, disagree with the administration," which considers operational caps an option.

Increased capacity, not increased restrictions, is what the region needs, she said. "We don't like caps. We fear caps; we hate caps." She criticized the FAA for failing to increase throughput at the region's airports while setting caps on operations. "In 1973, the FAA noted that the throughput at Kennedy was 83 an hour. I was typing papers on an IBM Selectric with carbon paper and Wite-Out. Thirty-four years later, $11 billion later, it is still 83 an hour. I cannot accept that number," she said.

Jeffrey Wharff of the FAA said the administration was trying to take into account "a number of different perspectives but always with an eye to reducing disruption to the system. The administration does not have the luxury of one solution that will benefit one segment of society. We must balance all concerns."

Sharon Pinkerton of the Air Transport Association said she wished to "echo Patty [Clark]'s remarks. We see a serious diminishment in throughput at the New York airports in the last two the years. The administration needs to focus on increasing capacity."

She also cited the FAA's difficult relations with air traffic controllers. "They had a very unique provision in their contract that allowed the administration to impose a contract on the controllers. The controllers are furious about that, and as a result have spent a lot of time on Capitol Hill trying to reverse that. We need to recognize that as an issue in New York as well."

While their "number one goal" is increasing capacity, she said that the airlines "very reluctantly" have come to support a cap on slots with trading possibilities at JFK. There would have to be a mix of administrative controls and market mechanisms, with congestion pricing "absolutely rejected." Additionally, any program to cap slots must take into consideration investments that airlines are making and have made at airports in terminals and other costly infrastructure. That is why her group has endorsed the IATA [International Air Transport Association] Worldwide Scheduling Guidelines.

**The landing slots dilemma**

Economist Frank Berardino, with GRA, Inc., a leading aviation consulting firm, said that auctions of slots would work. But there are "clear distributional issues between the airports and the airlines" due to investments both parties have made in infrastructure. "And obviously the other person not in the room, the consumer, has an interest," he added. Sometimes that means there is more interest in "two flights to Syracuse than 18 flights to Los Angeles," alluding to political pressure to preserve routes that might not be efficient.

He noted that property rights issues involved in airline landing slots are "not very well defined at all. We started out with a temporary program, and that lasted 35 years, and they were defined on an ad hoc basis. The airlines asserted the property right; they were allowed to buy and sell slots after 1984, amortize them on their balance sheets, and they could exchange them. Somebody once said that possession is nine-tenths of the law, and the airlines did a pretty good job of asserting that right."

"Then, January 1, 2007 hit. All of a sudden, there were no more slots. Legislation ended them at JFK. The government was again confronted with a property rights problem. In the short term it became clear they had to do something."

**Making the leap to "3 X" capacity with NextGen**

Doug Lee of the Volpe Center noted that he had been a champion of congestion pricing for some 40 years and had recently been involved in the Department of Transportation's pilot program to test congestion pricing, among other strategies, on surface highways. "That program has been surprisingly successful in attracting interest," he noted.

He attributes that to a long campaign of explaining how it might work. "When I started teaching and promoting congestion pricing, the language of economics was not permitted in surface transportation discussions, and the general attitude towards congestion was that you ought to get a discount because there are so many people that the cost must be lower when you share it."

Currently, he's involved in "blue sky" aviation research looking to integrate new technologies and systems to increase throughput without building more physical capacity, similar to the approach being developed by the FAA's Next Gen program, which is pouring large sums into technological solutions to wring more capacity out of the existing system, with a goal of tripling throughput. It is a large challenge, Lee said.

"If you're going to get from the current level of passenger service to one and a half times that to two times that to the magic three times that," which is the NextGen goal, "what is it going to take? In the [ARC] report, it says that these improvements will get you at least six more slots at one of the airports, that's
1.06 X, so 1.5 X is pretty big, and 3 X is huge.

"We can imagine a lot of things, but an essential requirement is to cause behavior change. That's clearly true in highway congestion. If there is no behavior change possible, the alternative is that people can't respond, then there is no effect."

—Phyllis Orrick

PDF of article
Leaving on a Jet Plane

Jasenka Rakas' airport design students grapple with real-world, real-time aviation issues in her popular CE 153 class

On her early morning walks down from the hills to her office, Berkeley CEE lecturer, aviation researcher, and NEXTOR Deputy Director Jasenka Rakas' mind is never far from the sky—which is home at any given moment, she reminds us, to five or six thousand aircraft—and source for what she calls "the magical world of aviation."

Rakas begins her CE 153 class with a kind of ode to the color blue. "Blue is the color of the aviation world, but blue is a color with no dimension," she says quoting one of her favorite artists, Yves Klein. "Blue is beyond dimension, while other colors are not."

Already we're hooked.

Warned not to fly too close to the sun, Icarus, in his reckless joy, ignores his father's warning, melts the wax that secured his wings, and falls into the sea.

Rakas relishes the stories of the so-called flight "chauffeurs," who in the 19th century, looked at powered flight in a brute force thrust and lift manner—"build an engine, slap it on an airframe strong enough to withstand the forces and generate lift." But those who followed, including aviation pioneer Otto Lilienthal, says Rakas, "were the real airmen. They were the ones who recognized the need to get up in the air, fly around in gliders, and understand the feel of flying. It was this philosophy, and the airmen's concern with flight control, that ultimately led to successfully-powered flight."

The historical context sets the stage for the tangle of issues that challenge the aviation industry today. It's here that Rakas gets to the core of her teaching: to intrigue students with the nuts and bolts of major airports' current dilemmas, and perhaps, to bring a fresh influx of ideas and talent into the field.
“The U.S. accounts for about 30 percent of the world’s aviation, yet our current system can’t absorb the increased demand,” says Rakas. “There’s a fundamental need right now to improve our future aviation workforce. If we’re not careful, we will run out of aviation engineers very soon.”

And this at a time when airports face enormous challenges as they transition toward modernization. This huge effort, shepherded by the FAA and other agencies, began in response to an army of problems—poor visibility in bad weather, staggering increases in flying demand, aging navigational equipment, and the current “hub-and-spoke” system, which adds to delays by forcing large numbers of aircraft to arrive at busy airports within short periods of time for passenger transfers.

But real-world crises are fodder for fine teaching and CE 153 is no exception. Last fall semester’s 30 students, many of whom were new to aviation, drilled into those issues considered pivotal to modernizing today’s airports. They explored airport noise pollution, new technologies, airspace structure, and environmental code conformance to upgrade terminal buildings, gates, taxiway and runway exit designs to meet increased traffic demands.

Take airport noise pollution. You can read all about it, study the decibels, frequencies, and sound wave projections, but it tingles in your ears only when you hear it, even if it’s from an instrument simulating a few aspects of noise pollution. Rakas picks up her guitar (she’s also a musician) to illustrate how sound can turn into noise, asking students to differentiate between pitch, frequency, and sound intensity in order to “get” what bothers residents who live in the wake of active airport runways. Getting it is part one; designing noise mitigation systems is part two and crucial to Rakas’ notion of analyzing aviation problems and designing workable solutions.

“We use some traditional mathematical techniques in the class, but I’m against letting students rely only on mechanical equations to calculate their answers or feel finished after a quick glance at Wikipedia. Here we use mechanical equations in a larger context to design complex systems. I try to inspire my students to come up with new design concepts and new ways of operating so they perceive problems in completely different ways.”

Early in the semester, Rakas invites a group of professionals from NEXTOR’s industry partnership program who work at high-level airports to participate in labs and lectures. Industry partners are often instrumental in the one-day field trip the class takes to a major airport (see story below). As the semester winds down, this same group of professionals act as the panel of experts as students present their final projects—comprehensive master plans for a large-scale airport renovation system.

“This is a very dynamic design class,” says former CEE undergrad Justin Bychek, who took Rakas’ class last year and now serves as the class’s special assistant. “Rather than being a completely technical structural design class, we’re creating a comprehensive report designed to be released to a ‘virtual’ client. The class ties together all that you learn with a deliverable project that prepares you for real work.”

— Nancy Bronstein

SFO to LAX: Ticket To Ride

A central piece of aviation researcher Jasenka Rakas’ airport design class is a one-day field trip to a major airport, the past two years to LAX and underwritten by Virgin America Airlines. Not only does the experience give students hands-on access to the airside, landside, and commercial jet operations of a modern-day airport, it ties their observations to their ongoing airport master plan projects. During a five-hour tour led by one of LAX’s top planners, students observed airport layout problems, runway capacity, airline, cargo and security operations, and baggage handling.

“The field trip is an exercise in critical thinking, creativity, and engineering judgment,” says Rakas. “LAX is an excellent, almost scholarly example of a large, complex hub-and-spoke international airport that is undertaking major renovations as a result of reaching maximum capacity. By far the largest airport on the west coast in terms of passenger volume, LAX is also the largest airport in the world in terms of origin/destination passengers, and had to be prepared to accommodate the largest aircraft in the world.”

In fact, the A380, the relatively new double-decker airbus, accommodating more than 800 passengers in economy class, is expected to have the largest number of daily operations at LAX, the most of any North American airport.
Students reacted enthusiastically to the field trip, waxing ecstatic about Virgin America's leather seats, individual interactive computer system, and the mood lighting: "more like a nightclub" than an airline cabin, wrote one. But they also noted significant problems at LAX: long taxi times, high noise levels in nearby residential areas, the lack of mass transit to LAX, and the ensuing back-up after an airliner went out of service on a runway. In papers they wrote after their return, they postulated possible solutions, which they detailed more thoroughly in a final project presented in the form of professional-looking reports on topics ranging from runway and taxiway design and LAX ground access to the landside impacts of a midfield satellite terminal.

"If we return to LAX fall semester," says Rakas, "we'll look at it from an entirely different perspective, that of green airports, and explore how to run an airport that size in the most environmentally friendly, emission-free, noise-free, energy-efficient ways."

—NB